

PortMaster Office Router



Hardware Installation Guide

Livingston
Enterprises, Inc.



PortMaster Office Router Hardware Installation Guide

OR-M, OR-ST, OR-U, OR-LS, OR-HS

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Preface

About this Guide

This guide provides complete installation instructions for the PortMaster™ Office Router.

Once installed, the Office Router may be configured using the PMconsole™ user interface. For information about PMconsole and other Livingston products, see page viii.



Note – This guide is designed to be used by qualified system administrators and network managers. Knowledge of basic networking concepts is required to successfully install your Office Router.

Preview of this Guide

The *PortMaster Office Router Hardware Installation Guide* includes the following chapters:

Chapter 1, “Overview” introduces the PortMaster Office Router.

Chapter 2, “Preparing for Installation” provides pre-installation safety and device requirements and describes required tools and equipment.

Chapter 3, “Installing the PortMaster Office Router” provides step-by-step physical, electrical, and online installation instructions.

Chapter 4, “Troubleshooting the Hardware Installation” discusses some potential installation difficulties and suggests remedies for these problems.

The appendices provide tips for ordering ISDN service, electrical and physical specifications, cabling specifications, and modem requirements.

An index is also included.

Related Documentation

Livingston's PMconsole software may be used to configure the Office Router. PMconsole guides you through configuration using a simple graphic interface. It is available for Windows and for many versions of UNIX.

To configure the Office Router using PMconsole for Windows, see the *PMconsole for Windows Administrator's Guide*. To configure the Office Router using a UNIX version of PMconsole, see the *PMconsole for UNIX Administrator's Guide*.

The Office Router may also be configured without PMconsole, using a command line interface. Configuring the Office Router in this manner is described in the *Configuration Guide for PortMaster Products*. This manual describes all available commands; in addition, it provides an overview of networking and configuration issues related to the PortMaster series of products.

Document Conventions

The following table describes the type changes and symbols used in this guide.

Typeface or Symbol	Meaning	Example
AaBbCc123	The names of commands, parameters, and directories; on-screen computer output.	Use <code>version</code> to display the version number.
AaBbCc123	What you type, contrasted with on-screen computer output.	login: !root Password:
<i>AaBbCc123</i>	Command-line placeholder: replace with a real name or value.	To set baud rate, type: set s0 speed 2 baud_rate
[AaBbCc123]	Commands in brackets denote a key to press.	login: !root [Enter]

Contacting Livingston Technical Support

Every Livingston product comes with a one year hardware warranty.

To obtain technical support, contact Livingston Monday through Friday between the hours of 6 a.m. and 5 p.m. (GMT -8) Please record your ComOS version number and report it to the technical support staff.

- By voice, dial (800) 458-9966 within the USA or +1 (510) 426-0770 from outside the USA
- By FAX, dial +1 (510) 426-8951
- Via electronic mail, send mail to support@livingston.com
- Via the World Wide Web, contact <http://www.livingston.com/>

New releases and upgrades of Livingston software are available via anonymous FTP from <ftp.livingston.com>.



Note – Livingston maintains an Internet mailing list for PortMaster users. To subscribe, send electronic mail to portmaster-users-request@livingston.com. Type `subscribe` in the body of the message.

The mailing list is also available in a daily digest format. To receive the digest, send electronic mail to portmaster-users-digest-request@livingston.com with `subscribe` in the body of the message.

The PortMaster Office Router provides IP and IPX routing between Ethernet and the following:

- Model OR-M—dial-on-demand phone lines using a PCMCIA (Personal Computer Memory Card International Association) modem or external modem
- Model OR-ST—dial-on-demand line using an ISDN BRI (ST interface)
- Model OR-U—dial-on-demand line using an ISDN BRI (with integrated NT1, a U interface)
- Model OR-LS—synchronous line running PPP or Frame Relay up to 384Kbps
- Model OR-HS—synchronous line running PPP or Frame Relay up to T1/E1 (2.048Mbps)

The office router is intended for use in remote offices or home networks. It has the same capabilities as the PortMaster PM and IRX series, including full packet filtering ability.

The PortMaster Office Router comes with an Ethernet port (AUI or twisted pair), an RJ-45 port to connect a console or external modem, and one of the following:

- (OR-M) PCMCIA modem slot
- (OR-ST) RJ-45 ISDN BRI port (ST interface)
- (OR-U) RJ-45 ISDN BRI port with integrated NT1 (U interface)
- (OR-LS) DB-25 V.35 synchronous port (384Kbps)
- (OR-HS) DB-25 V.35 T1/E1 synchronous port (2.048Mbps)

This manual provides hardware installation procedures. For configuration instructions, refer to the *Configuration Guide for PortMaster Products*.

This chapter includes the following pre-installation topics: safety recommendations, general site requirements, cable requirements, power guidelines, modem requirements, and tools and equipment required.

Safety Recommendations



Warning – The PortMaster Office Router contains no user-serviceable parts. The chassis should never be opened.

When using the router, always follow these safety guidelines:

- Keep the chassis area clear and dust-free during and after installation.
- Disconnect all power before doing the following:
 - Connecting cables
 - Changing a PCMCIA modem
 - Changing a fuse
 - Installing or moving the unit
- Never assume power is disconnected from a circuit. Always check.
- Before applying power:
 - Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, and missing safety grounds.
 - Locate the emergency power-off switch for the room in which you are working.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.

General Site Requirements

This section describes the requirements your site must meet for safe installation and unimpeded operation of the PortMaster Office Router. Prepare your site properly before beginning installation.

Site Environment

Choose a clean, dust-free and (preferably) air conditioned location. Avoid direct sunlight, proximity to heat sources, and areas with high levels of electromagnetic interference (EMI).

Chassis Accessibility

Select a location that provides front panel visibility, so that you can monitor the router LED indicators. Leave at least three (3) inches (8 cm) clearance at the rear of the router.

Cooling and Airflow

To prevent overheating, the operating environment for the router should not exceed 104°F (40°C). For proper airflow, allow at least three (3) inches (8 cm) clearance around the vent openings.

Power Guidelines

Before applying power, read the following power guidelines carefully:

- Inspect the router to verify that:
 - Cables are installed correctly
 - Ventilation is adequate
 - Power is coming from a building branch circuit
- Before you connect to a power source, verify that the source is properly grounded and falls within the (internal) power supply rating. The PortMaster Office Router operates correctly at any AC voltage from 100V to 260V and frequencies from 50 to 60 Hz.

Tools and Equipment Required

The PortMaster Office Router has no internal user-serviceable parts. It is possible, however, to change the fuse. A 3/16" flat-blade screwdriver is required to change the fuse.



Caution – Consult “Changing the Fuse” on page 3-5 before changing the router fuse.

Cable Requirements

The required cables for the PortMaster Office Router are described in the following sections.

Appendix C, "Cabling Specifications," provides pinouts for the required cables.

Ethernet Cable

The Ethernet 10BaseT port accepts a modular RJ-45 connector. 10BaseT requires a minimum Category 3 twisted pair cable, as specified by the EIA/TIA-568-B wiring standard. The distance limitation for 10BaseT is a maximum of 328 feet (100m).

The Ethernet AUI port accepts a standard AUI cable with a DB-15 female connector.

PCMCIA Cable

The PCMCIA slot on the OR-M accepts a Type-2 PCMCIA modem card. The PCMCIA modem generally comes with a cable to connect to a wall jack.

Console Cable

The router comes with an RJ-45 to DB-25 female cable for connecting the serial port on a PC to the S0 (asynchronous serial) port on the PortMaster. You can also connect a standard ASCII terminal to this port using a DB-25 null modem cable, or connect an external modem using a standard modem cable.



Note – To connect to a PC serial port, a 25-pin to 9-pin serial adapter may be required. To connect to a terminal, a male-to-male gender changer is required. Neither the adapter nor the gender changer are included with the router.

ISDN BRI Cables

The OR-ST is shipped with an RJ-45 cable for an ISDN BRI, providing an ST interface in countries that follow international ISDN standards. Pins 3-6 of the cable are used to carry signalling for two B-channels and one D-channel.

The OR-U is shipped with an RJ-45 cable for an ISDN BRI with integrated NT1, providing a U interface in countries that follow USA telephone standards. The middle two pins (pins 4 and 5) of the cable are used to carry signalling for two B-channels and one D-channel.

Synchronous Cable

Port W1 on the OR-LS is capable of speeds up to 384Kbps. Port W1 on the OR-HS is capable of speeds up to T1/E1 (2.048Mbps). The synchronous port requires an external clock signal, normally provided by the telephone company.

The W1 port may be used in conjunction with a synchronous V.35, RS-530, or X.21 cable. These cables may be ordered separately from Livingston Enterprises.

For cabling specifications, refer to Appendix C, "Cabling Specifications."



Caution – The synchronous port does not function as an asynchronous port. Do not attempt to connect an asynchronous device to this port.

Modem Requirements

The PortMaster Office Router OR-M can use a PCMCIA Type-2 modem that you provide.

All PortMaster Office Routers can use an external modem connected to port S0 when the port is not being used as a console.

Appendix D, "Using Modems with the PortMaster," lists verified PCMCIA modems and configuration guidelines for other modems.

Installing the PortMaster Office Router

3



Caution – Before you install the PortMaster Office Router, read Chapter 2, “Preparing for Installation.”

This chapter includes the following installation topics: desktop installation, overview of front panel LEDs, overview of rear panel connectors and DIP switches, connecting to the network, and configuring the PortMaster Office Router.

Overview of Front Panel LEDs

Figure 3-1 shows the front-panel LEDs for Office Router model OR-M.



Figure 3-1 PortMaster Office Router—Front-Panel LEDs (OR-M)

Figure 3-2 shows the front-panel LEDs for model OR-ST.

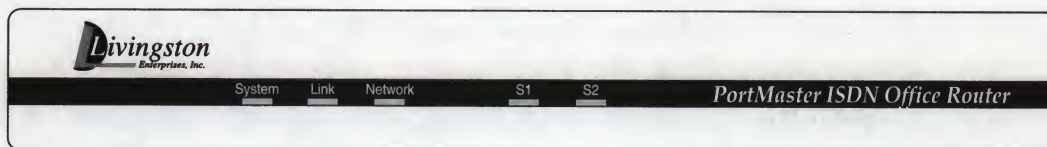


Figure 3-2 PortMaster Office Router—Front-Panel LEDs (OR-ST)

Figure 3-3 shows the front-panel LEDs for model OR-U.

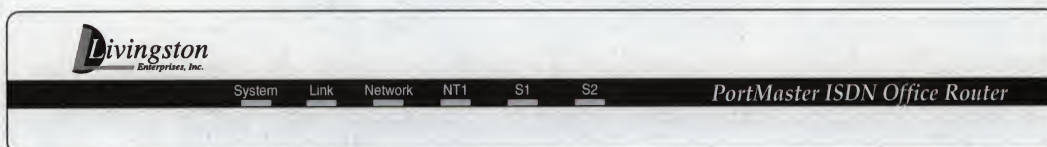


Figure 3-3 PortMaster Office Router—Front-Panel LEDs (OR-U)

Figure 3-4 shows the front-panel LEDs for model OR-LS.



Figure 3-4 PortMaster Office Router—Front-Panel LEDs (OR-LS)

Figure 3-5 shows the front-panel LEDs for model OR-HS.



Figure 3-5 PortMaster Office Router—Front-Panel LEDs (OR-HS)

LEDs are described in Table 3-1. Use the LED descriptions to verify proper operation.

Table 3-1 Front-Panel LED Descriptions

LED	Description
System	<p>This LED provides three types of diagnostic information:</p> <ul style="list-style-type: none"> • During initial hardware self-test, the LED blinks three times per second, then once per second. • After the power-on self-test is successfully completed, and while the operating system is loading, the LED blinks at one-second intervals. • When the system is fully operational, the LED remains on, blinking off once every five seconds.
Link	This LED is on when the system has link integrity to a 10BaseT hub.
Network	This LED blinks to indicate Ethernet traffic. During heavy traffic, this light may appear solid, due to the rapidity of its blinking.
NT1 (OR-U only)	<p>When you first turn power on, this LED blinks 8 times per second for about one second while performing an internal self-test of the NT1. If this does not occur, contact Livingston Technical Support. If no SPID is set on the port and there is no circuit to the telephone company, the LED goes off. If no SPID is set on the port but there is a circuit to the telephone company, the LED will blink once per second. If there is a valid SPID and a circuit the LED blinks once per second while synchronizing with the telephone company, then becomes solid.</p>
S1 (OR-U and OR-ST only)	This LED is on when ISDN port S1 has an established connection.
S2 (OR-U and OR-ST only)	This LED is on when ISDN port S2 has an established connection.

Overview of Rear Panel Connectors and DIP Switches

The rear panel of the PortMaster Office Router provides (left to right): a power switch, a user-serviceable fuse, an AC power receptacle, an Ethernet 10BaseT port, an Ethernet AUI port, a PCMCIA modem slot (S1) or ISDN BRI port (S1-S2) or DB-25 V.35 synchronous port, a three-section DIP switch, and a serial console port (S0).

Figure 3-6 shows the Office Router OR-M rear panel.

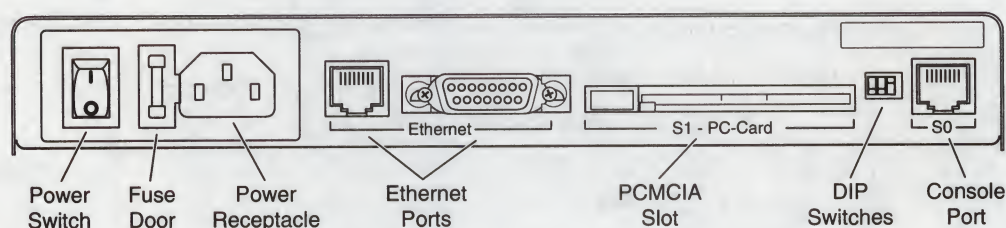


Figure 3-6 Rear Panel Connectors for OR-M

Figure 3-7 shows the OR-ST rear panel.

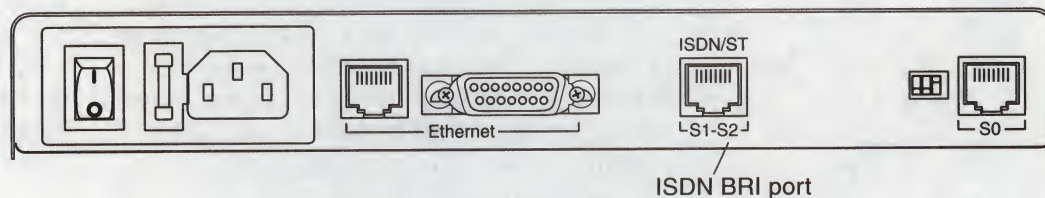


Figure 3-7 Rear Panel Connectors for OR-ST

Figure 3-8 shows the OR-U rear panel.

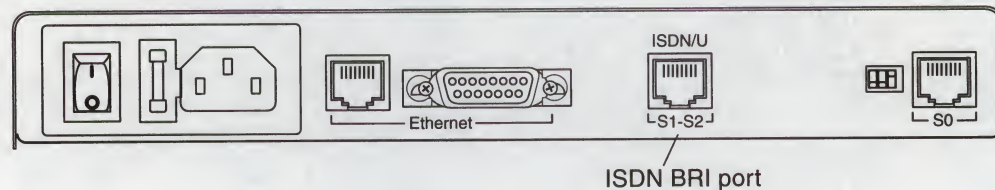


Figure 3-8 Rear Panel Connectors for OR-U

Figure 3-9 shows the OR-LS and OR-HS rear panel.

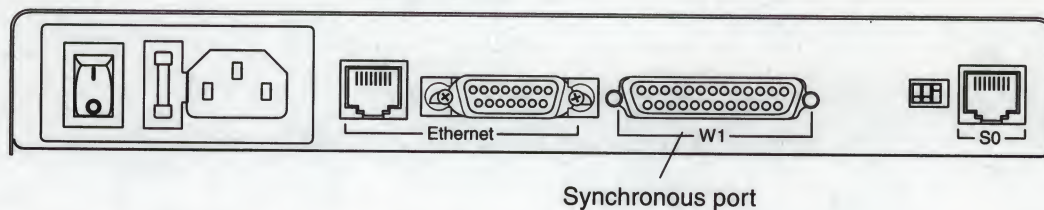


Figure 3-9 Rear Panel Connectors for OR-LS and OR-HS

Power Receptacle

AC power to the PortMaster is connected using a standard power cable. The PortMaster uses an auto-sensing, auto-ranging power supply that automatically adjusts to match the input voltage without setting a switch. The PortMaster operates correctly at any AC voltage from 100V to 260V and frequencies from 50 to 60 Hz.



Warning – Before you apply power, refer to “Safety Recommendations” on page 2-1 and “Power Guidelines” on page 2-2.

To apply power:

1. Attach the power cord to the router and to a properly grounded electrical outlet.
2. Set the power switch to the ON position.

To disconnect power:

1. Set the power switch to the OFF position.
2. Detach the power cord from the outlet and the router.

Changing the Fuse

The only user-serviceable part on the router is its fuse, which can be replaced. To change a fuse:

1. Switch the power switch to the OFF position.
2. Detach the power cord from the router.
3. Insert a 3/16” flat-head screwdriver between the fuse door and the chassis and gently pry the door open, as shown in Figure 3-10.

4. Replace the 250V, 2A fuse.

The fuse is easily removed and replaced and has no “wrong end.”

5. Press the fuse door shut until it clicks.

6. Reattach the power cord to the router.

7. Set the power switch to the ON position.

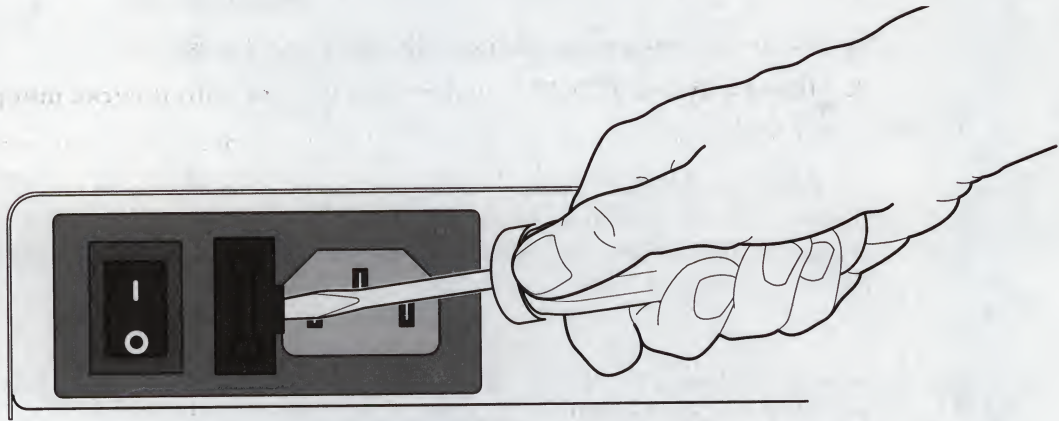


Figure 3-10 PortMaster Office Router—Changing the Fuse

Ethernet 10BaseT Port

The Ethernet 10BaseT port allows you to connect your PortMaster Office Router to a network 10BaseT hub using a straight-through configured twisted-pair cable with RJ-45 connectors. In order to connect to a 10BaseT network, DIP switch #3 must be UP.

Ethernet AUI Port

The Ethernet AUI port allows you to connect your PortMaster Office Router to a 10Base5, 10Base2 or 10BaseT transceiver using a straight-through cable with DB-15 connectors. In order to connect using the AUI port, DIP switch #3 must be DOWN.

PCMCIA Modem Slot

The PCMCIA modem slot is only available on the OR-M.

The router is preconfigured to accept and communicate using most Type-2 PCMCIA modems. For a list of verified PCMCIA modems, see Appendix D, "Using Modems with the PortMaster."

To install a PCMCIA modem:

1. **Set the power switch on the router to the OFF position.**
2. **Insert a Type-2 PCMCIA modem into the slot until it clicks into place.**

PCMCIA modems are physically keyed to ensure that they are installed correctly; however, the correct side must be facing upward. If you are unsure which side is up, refer to the manufacturer's documentation.

3. **Set the power switch on the PortMaster to the ON position.**

To remove a PCMCIA modem:

1. **Set the power switch on the router to the OFF position.**
2. **Push the eject button to the left of the PCMCIA slot.**

ISDN BRI Port

The ISDN BRI port is only available on the OR-ST and OR-U. Both models have a female RJ-45 connector marked S1-S2. On the OR-ST, this connector provides an ST interface. On the OR-U, this connector provides a U interface with integrated NT1.

The OR-ST BRI port attaches to a network termination device (NT1). The NT1 is then attached to an ISDN line from the telephone company, which uses two wires from an RJ-45 connector to provide two 64Kbps B channels plus one 16Kbps D channel for signalling.

The OR-U BRI port attaches directly to the ISDN line; an external NT1 is not necessary.

Synchronous Port

The synchronous port W1 is only available on the OR-LS and OR-HS.

Port W1 on the OR-LS is capable of speeds up to 384Kbps. Port W1 on the OR-HS is capable of speeds up to T1/E1 (2.048Mbps). The synchronous port requires an external clock signal.

The W1 port may be used with an X.21, RS-530, or V.35 cable. These cables are available separately from Livingston Enterprises; select the cable that is appropriate for your network.

For cabling specifications, refer to Appendix C, "Cabling Specifications."



Caution – The synchronous port does not function as an asynchronous port. Do not connect an asynchronous device to this port.

Three-Section DIP Switch

The PortMaster Office Router has a three-section Dual Inline Package (DIP) switch, shown in Figure 3-11:

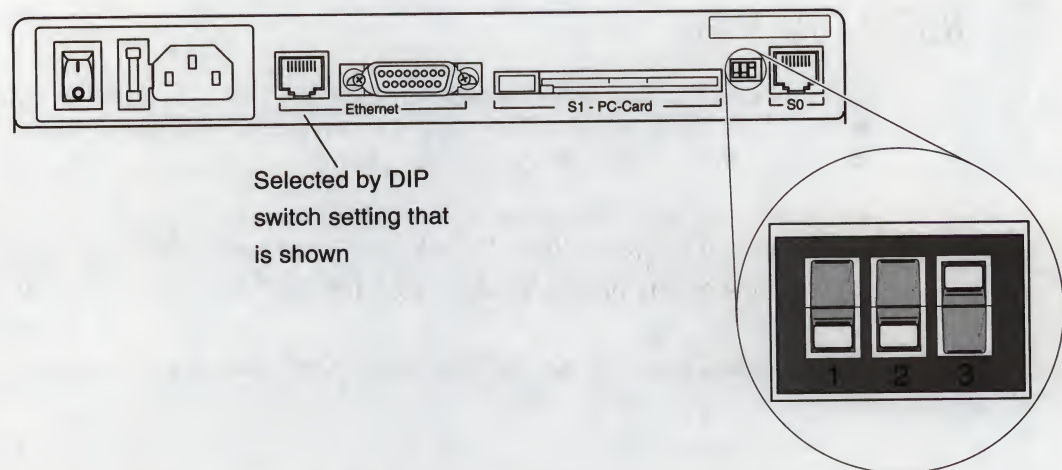


Figure 3-11 PortMaster Office Router—Rear Panel DIP Switches

- The left switch (DIP switch #1) controls the diagnostic mode.

When UP, the router boots in diagnostic mode. When DOWN, the router boots in normal mode. Default is DOWN. For information about the diagnostic mode, refer to "Diagnostic Boot Sequence" on page 4-3.

- The middle switch (DIP switch #2) controls the boot mode.

When UP, the router boots from the network using RARP and TFTP. When DOWN, it boots from internal flash memory. Default is DOWN.

For more information about using TFTP to boot the router, refer to the *Configuration Guide for PortMaster Products*.

- The right switch (DIP switch #3) selects the Ethernet network type.

When UP, the router connects through the 10BaseT Ethernet port. When DOWN, it connects through the AUI Ethernet port. Default is DOWN. As shown in Figure 3-11, DIP switch #3 is UP, selecting the 10BaseT port for connection to the Ethernet.



Caution – When changing the position of DIP switch #3, power must be off.

Serial Port (S0)

The S0 port connects to a PC serial port using the supplied cable. You may connect a standard ASCII terminal to this port with a DB-25 null modem cable. You may connect an external modem to this port with a straight-through cable.

When in normal mode (DIP switch #1 DOWN), the S0 port supports communications at up to 115,200 bps. In diagnostic mode (DIP switch #1 UP), the router sets the S0 port to 9600 bps, 8 data bits, no parity, 1 stop bit.



Note – To connect to a PC serial port, a 25-pin to 9-pin serial adapter may be required. To connect to a terminal, a male-to-male gender changer is required. Neither the adapter nor the gender changer are included with the router. For cabling specifications, refer to Appendix C, "Cabling Specifications."

Connecting to the Network, Phone Line and Console

Follow these instructions to connect the PortMaster Office Router to a network, a telephone wall jack, and a console (PC serial port or ASCII terminal). See Figure 3-12.

Please note the following:

- The PCMCIA card is applicable only to the OR-M
- The OR-ST accepts an RJ-45 cable to connect to an NT1
- The OR-U accepts an ISDN line directly
- The OR-LS and OR-HS accept a cable to a synchronous CSU/DSU

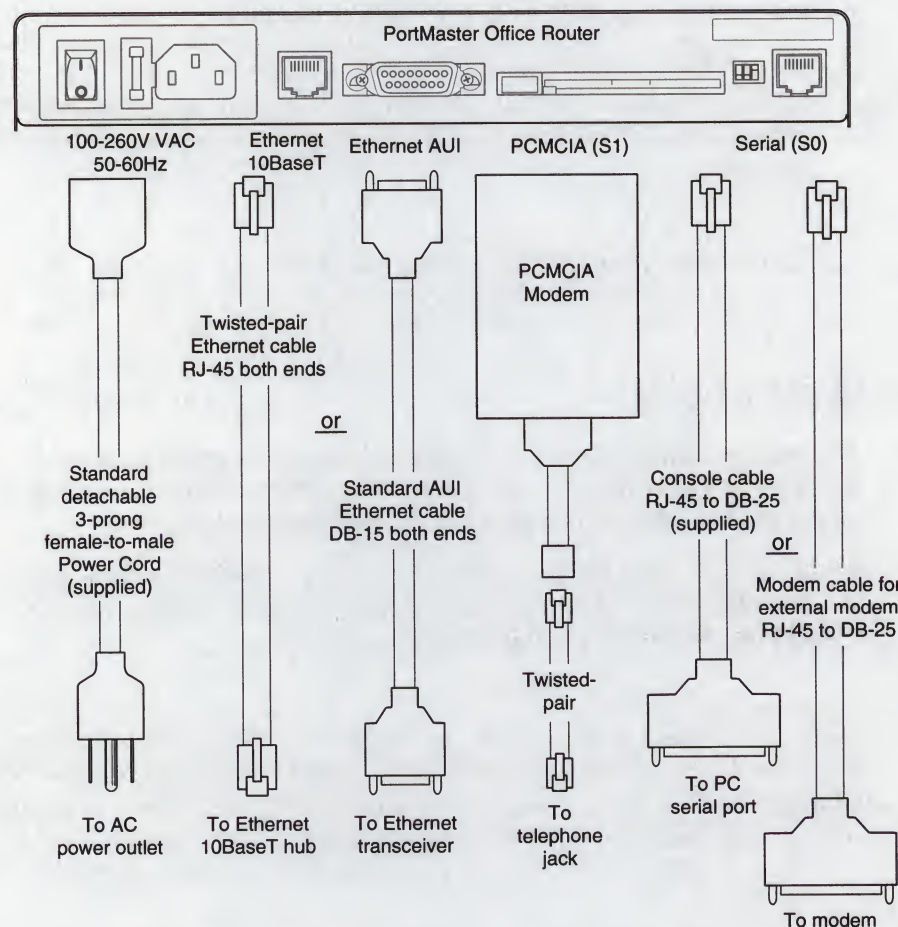


Figure 3-12 PortMaster Office Router—Connectors, Cables, and Cords

The following procedure gives you step-by-step instructions for installing the PortMaster Office Router.

1. **Set the power switch on the router to the OFF position.**
2. **If you are installing Model OR-M, insert a Type-2 PCMCIA modem into the slot until it clicks into place.**

PCMCIA modems are physically keyed to ensure that they are installed correctly; however, the correct side must be facing upward. If you are unsure which side is up, refer to the manufacturer's documentation. The PCMCIA modem does not come with the router. For a list of verified modems, see Appendix D, "Using Modems with the PortMaster."

3. **Perform one of the following procedures depending on your Office Router model:**
 - **OR-M**—Connect the modem cable supplied with your PCMCIA modem to the modem and to an *analog* telephone wall jack.
 - **OR-ST**—Connect one end of the supplied RJ-45 ISDN cable to the ISDN/ST port. Connect the remaining end to your NT1.
 - **OR-U**—Connect the ISDN line to the RJ-45 port with a cable. The OR-U comes with an RJ-45 to RJ-11 cable.
 - **OR-LS or OR-HS**—Connect the CSU/DSU to the DB-25 port with a RS-530 cable or V.35 cable or X.21 cable, as appropriate for your CSU/DSU.
4. **Attach the RJ-45 end of the supplied serial console cable to router port S0 and the DB-25 end of the cable to the serial port of a PC or ASCII terminal.**

To connect to a PC serial port, a 25-pin to 9-pin serial adapter may be required. To connect to a terminal, a male-to-male gender changer is required. Neither the adapter nor the gender changer are included with the router.



Warning – Before you apply power, refer to "Safety Recommendations" on page 2-1 and "Power Guidelines" on page 2-2.

5. **Attach the power cord to the router and to a properly grounded electrical outlet.**
6. **Connect the 10BaseT or AUI Ethernet port on the PortMaster Office Router to an Ethernet hub or transceiver using the appropriate cable.**

For information on switching between DIP switch settings for Ethernet, see "Three-Section DIP Switch" on page 3-8. The Ethernet cable does not come with the router.

7. **Set the power switch to the ON position.**

8. Verify that the System LED is active.

While the router is booting, the LED blinks three times per second, then once per second. The LED blinks OFF once every five seconds during normal operation. If the System LED does not behave in this way, see "Hardware Problems and Solutions" on page 4-1.

9. Verify that the Link LED is ON.

The Link LED blinks on once for AUI and twice for 10BaseT. Solid ON indicates that 10BaseT link integrity exists. Solid OFF indicates a link error for 10BaseT. The Link LED is not used for AUI. If the Link LED does not behave in this way, see "Hardware Problems and Solutions" on page 4-1.

10. Verify that the Network LED is ON when Ethernet traffic is present.

The Network LED blinks on once for every packet transmitted or received. In heavy traffic situations, the LED may appear solid. If the Network LED does not behave in this way, see "Hardware Problems and Solutions" on page 4-1.

11. Once the router has booted and all connections are verified, the console (PC or terminal) displays a login prompt:

```
login:
```

12. Enter the address of the Ethernet interface.

- a. If you are entering an IP address, type the following, pressing [Enter] after each line. Replace the italicized values with the values for your network:

```
login:      !root
Password:   [Enter]
Command>    set ether0 address 172.168.200.1
Command>    save all
Command>    quit
```

- b. If you are entering an IPX address, type the following as well:

```
Command>    set ether0 ipxnet AFAF0808
Command>    set ether0 ipxframe ethernet_802.2
Command>    save all
Command>    quit
```


- 13. If you are planning to use the command line interface to configure your router, you can do so now. If you are planning to use PMconsole to configure your router, you can disconnect the terminal from the S0 port now.**

For configuration information, consult the *Configuration Guide for PortMaster Products*. PMconsole can be used to configure all PortMaster products. PMconsole is available for Windows and many UNIX platforms. Once you have decided which interface to use, refer to the *Administrator's Guide* for that interface.

Troubleshooting the Hardware Installation

4

This chapter includes the following troubleshooting topics: hardware problems, solutions, and the boot sequence in diagnostic mode.

Hardware Problems and Solutions

Hardware problems during installation can be identified by certain LED indications. Table 4-1 identifies these behaviors, the likely cause, and the likely solution. If the solution requires contacting Livingston Technical Support, refer to page ix of the Preface for contact information. For behavior of the ISDN LEDs on the OR-U and OR-ST, see Table 3-1 on page 3-3.

Table 4-1 Hardware Problems and Solutions

LED Indication	Likely Cause	Solution
System LED fails to light.	Lack of power.	Check power switch, power cable, outlet, and fuse.
During power-on, the System LED fails to light, becomes solid ON, or becomes stuck at blinking three times per second.	Hardware problem.	Contact Livingston Technical Support.
During power-on, the System LED continues blinking once per second for more than a minute.	DIP switch #2 UP and no boot server present.	If you have no boot server, verify that DIP switch #2 is in the down position; otherwise, see the "Network Booting" procedure in the <i>Configuration Guide for PortMaster Products</i> .
	Flash RAM contents corrupt.	Follow the <i>Configuration Guide for PortMaster Products</i> procedure for "Network Booting" and rewriting the contents of Flash RAM.

Table 4-1 Hardware Problems and Solutions (Continued)

LED Indication	Likely Cause	Solution
Immediately after booting, the System LED becomes stuck at solid ON or solid OFF.	Flash RAM problem.	Contact Livingston Technical Support.
During operation, the System LED becomes stuck at solid ON or solid OFF.	Hardware failure (possibly caused by an external device).	If still solid ON or OFF after removing all external devices (except the diagnostics terminal), contact Livingston Technical Support.
No console login prompt.	Incorrect terminal settings, bad connection, or bad cable.	Verify that a cable is plugged into S0. Verify terminal settings of 9600, 8N1. Verify that DIP switch #1 is UP. Verify that you have a working null modem cable and that it is properly connected at both ends. See Appendix C, "Cabling Specifications".
Link LED is solid OFF.	If you are connected to an AUI Ethernet transceiver, this is not a problem. If you are connected to a 10BaseT Ethernet hub, you do not have link integrity.	Verify that DIP switch #3 is UP (for 10BaseT), that you have a working 10BaseT cable, and that it is properly connected at this end and at the hub.
Network LED is solid ON.	If traffic is heavy, this is only an illusion. If no packets are being passed, you may have an incorrectly cabled network.	Verify correct network cabling.
Network LED is solid OFF.	If there is no traffic, this is normal. If packets cannot be passed, you may have an incorrectly cabled network.	Verify correct network cabling.

Table 4-1 Hardware Problems and Solutions (Continued)

LED Indication	Likely Cause	Solution
Port S1 does not appear during configuration of the PortMaster Office Router OR-M.	PCMCIA modem is not seen by the router at power on.	Turn power off, insert PCMCIA modem card (consult manufacturer's documentation to ensure that the correct side is up), then turn power on.
Undefined difficulty with power-up and you are not able to isolate the problem by observing LED behavior.	Unknown	Power up in Diagnostic Mode. For information about diagnostic mode, refer to "Diagnostic Boot Sequence" on page 3. If the displayed diagnostics do not suggest a solution, record the information and contact Livingston Technical Support.

Diagnostic Boot Sequence

If you are having difficulty with booting and are unable to isolate the problem by observing LED behavior, you may wish to boot in diagnostic mode, as follows:

1. Set the power switch on the router to the OFF position.
2. Set the terminal to 9600 baud, 8 data bits, no parity, 1 stop bit, software flow control (XON/XOFF).
3. Move the left DIP switch (#1) to the UP position.
4. Attach a terminal or PC to the console port (S0) using a null modem cable.

Refer to Table C-1 in Appendix C for cable pinouts.



Warning – Before you reapply power, refer to "Safety Recommendations" on page 2-1 and "Power Guidelines" on page 2-2.

5. Switch the power switch to the ON position.

6. Observe the boot diagnostics displayed on the console screen.

Figure 4-1 displays an example of one unit's diagnostic boot messages. For an explanation of each message, see Table 4-2.

```
Livingston Enterprises, Inc. Boot Prom Rev K

Testing Low Memory ....
Testing System Clock ....
Testing System Memory .... A000
Checking Boot Rom ....
Starting FLASH Boot .....
Booting From Flash Type Am29F040
Loading Image at 0fff0000
320112 flash copy complete
Verifying Load Module Checksum ...
Starting Load Module ...
Testing High Memory ... . 1024K
PCMCIA slot .... PCMCIA card type
Found 2 ports....
Running ComOS...
PortMaster Console login:
```

Figure 4-1 OR-M Diagnostic Boot Messages

Table 4-2 Interpreting the Diagnostic Boot Messages

Field	Possible Message	What it Means
Boot Prom Rev	K	Version number of the boot prom.
Testing Low Memory	ERROR	Message indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Testing System Clock	ERROR	Message indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Testing System Memory	ERROR at failed memory address	Message indicates a boot failure. Record all information to this point and contact Livingston Technical Support.

Table 4-2 Interpreting the Diagnostic Boot Messages (Continued)

Field	Possible Message	What it Means
Checking Boot Rom	ERROR	Message indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Starting FLASH Boot	N/A	
Booting from FLASH type	Am29F040	Flash brand name.
Loading Image at	0fff0000	RAM Address.
flash copy complete	320112	Counter for Flash bytes transferred to RAM. If the counter freezes, record all information to this point and contact Livingston Technical Support.
Verifying Load Module Checksum	Invalid Length for Flash at RAM address	Message indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
Starting Load Module	N/A	
Loading kernel (OR-ST, OR-U, OR-LS, OR-HS only)	506088 bytes	Counter for Flash bytes transferred to DRAM. If the counter freezes, record all information to this point and contact Livingston Technical Support.
Testing High Memory	ERROR at failed memory address	Message indicates a boot failure. Record all information to this point and contact Livingston Technical Support.
PCMCIA slot (OR-M only)	PCMCIA card type	PCMCIA card type.
ISDN Found in Slot 0 - Testing memory (OR-ST, OR-U only)	512K	ISDN interface found. Test of ISDN memory in progress.
Found x Ports	1, 2, 3	Number of ports detected. Note that S0 is one port and PCMCIA is another. The BRI counts as two ports.

Table 4-2 Interpreting the Diagnostic Boot Messages (Continued)

Field	Possible Message	What it Means
ether0 active	16K burst - IO	Ethernet interface found. 16K detected as the maximum amount of data that may be transferred (input or output) at any given time on the Ethernet interface.
Running ComOS	N/A	If system hangs at this point and does not print the next message, the configuration flash memory has been corrupted. Refer to the "Troubleshooting" chapter of the <i>Configuration Guide for PortMaster Products</i> .
PortMaster Console login:	N/A	System up and running.

Ordering ISDN Service (OR-U only)

A

This appendix applies only to OR-U users installing the unit in the USA and Canada.

Call your local telephone carrier to find out about ISDN service availability, pricing, and features. Typically there is an ISDN installation cost, a monthly flat-rate service cost, and usage costs.

For a list of ISDN providers in the USA and Canada see page A-4.

Ordering Instructions

Your telephone carrier may inquire about your ISDN interface. Read the following information to the carrier:

"I have an ISDN device with a BRI (Basic Rate Interface) port which provides two "B" channels for data and one "D" channel for signalling. The BRI port has an integrated NT1, providing a U interface."

Step-by-step instructions for ordering ISDN service are provided on the following pages.

1. **Ask your provider what the costs are for CSV/CSD (Circuit-Switched Voice/Circuit-Switched Data) and for CSD (Circuit-Switched Data) and select the less expensive service.**

The OR-U can be used for data transmission only. However, many ISDN providers offer both data and voice service over ISDN at less cost than data only, and the router can use channels configured that way for transmitting data.

If ordering voice and data is less expensive than data only, have both ISDN B channels configured for CSV/CSD, even though the router will only transmit data over the line. If data is less expensive than voice and data service, have the two ISDN B channels configured for CSD. The OR-U will work with either configuration.

Ask your provider:

"Does it cost more to configure my ISDN line for both voice and data than it does for just data?"

If the answer is no, tell the provider:

"Provision both ISDN B channels for voice and data and the D channel for call signalling."

If the answer is yes (voice and data costs more than just data) tell the provider:

"Provision both ISDN B channels for data only and the D channel for call signalling."

2. Be ready to provide switch type translations.

Ask your provider:

"What ISDN switch type will I be connected to?"

Based on the answer, FAX or read them the appropriate one-page table from this chapter:

If the response is	FAX (or read) from
"National ISDN-1" or "NI-1 compliant"	Table A-3
"AT&T 5ESS Custom Multi-Point"	Table A-4
"AT&T 5ESS Custom Point-to-Point"	Table A-5
"Northern Telecom DMS-100 Custom" or "DMS-100"	Table A-6

3. Choose a carrier for long-distance ISDN service.

It may be easiest to stay with the same company that provides your existing analog long-distance service, though this is not a requirement.

4. Configure your site wiring to support ISDN service.

Ask your provider what additional wiring is necessary to support ISDN on your premises.

Depending on your existing wiring, you may need to have an extra pair of copper wires brought to your premises or additional inside wiring installed.

Make sure your ISDN wall jack is RJ-11 (four pins, like a telephone jack). If it is an RJ-45 jack (8 pins), you will need to use an RJ-45 to RJ-45 cable, rather than the RJ-11 cable provided with the OR-U.

5. Get your Switch Type, SPID(s) and Directory Number(s).

Table A-1 provides a form to record your ISDN service information. You need this information to configure the OR-U.

Table A-1 Personal ISDN Service Information

ISDN information	Value
Switch Type	<input type="checkbox"/> National ISDN-1 (NI-1) <input type="checkbox"/> AT&T 5ESS Custom Multi-Point <input type="checkbox"/> AT&T 5ESS Custom Point-to-Point ¹ <input type="checkbox"/> Northern Telecom DMS-100 Custom
SPID 1	
SPID 2	
Directory Number 1	
Directory Number 2	

1. In most cases, 5ESS Custom Point-to-Point does not require SPIDs. In addition, the service provider will only issue one directory number, used for S1 and S2.

The SPID (Service Profile Identifier) identifies your equipment to the ISDN switch. Directory Numbers are the telephone number(s) assigned to your ISDN B channels by the Telephone Company.

To configure the ISDN Switch Type, SPID, and/or port directory numbers on the OR-U, see the "ISDN Connections" chapter of the *Configuration Guide for PortMaster Products*.

6. Get the ISDN phone number from your Internet Service Provider.

Contact your Internet (or other) Service Provider for a phone number that supports ISDN connections. Record it here for later use:

Note that your ISDN Provider is the company that provides ISDN service to your house. This company may be different than your Internet Service Provider, the company that you call using ISDN in order to connect to the Internet.

ISDN Providers

Table A-2 provides a list of ISDN providers in the USA and Canada and their phone numbers.

Table A-2 ISDN Providers

Contact Information	State
Ameritech 1-800-TEAMDATA	Illinois, Indiana, Michigan, Ohio
Bell Atlantic 1-800-570-ISDN	Delaware, Maryland, New Jersey, Pennsylvania, Virginia, Washington DC, West Virginia
Bell South 1-800-428-ISDN	Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee
Cincinnati Bell 513-566-DATA	Ohio, Kentucky
Nevada Bell 702-688-7124	Nevada

Table A-2 ISDN Providers (Continued)

Contact Information	State
NYNEX 1-800-GET-ISDN 617-743-1333	Massachusetts, Maine, New Hampshire, New York (except Rochester), Rhode Island, and Vermont
Pacific Bell 1-800-472-ISDN	California
Rochester Telephone 716-777-1234	Rochester, NY area
Southern New England Telephone 1-800-430-ISDN	Connecticut
Southwestern Bell 1-800-SWB-ISDN	Arkansas, Kansas, Missouri, Oklahoma, Texas
US West 1-800-358-4513	Arizona, Colorado, Idaho, Iowa, Minnesota, Montana, N. Dakota, Nebraska, New Mexico, Oregon, S. Dakota, Utah, Washington, Wyoming
AGT 403-530-7100	Alberta
BC TEL 604-432-5529	British Columbia
Bell Canada 1-800-334-4736 514-870-4636	Ontario Quebec
MT&T - Island Tel 902-487-4723	Nova Scotia - PEI
MTS 204-941-8784	Manitoba
NBTel 506-658-7980	New Brunswick
Newfoundland Tel 709-739-2023	Newfoundland
SaskTel 306-777-5454	Saskatchewan

Table A-3 National ISDN-1 (NI-1) Switch Translations

Attribute	Parameter
Line	2B+D
Line Code	2B1Q
Terminal Type	A
MAX B Channels	2
B1	CSD (or CSVD)
B2	CSD (or CSVD)
D	signalling
CSD	2
CSD CHANNEL	any
CSD LIMIT	2
ACT USR	Yes
Dynamic TEI	Yes
EKTS	No
MTERM	1
CA PREF	1
Call Appearances	Idle
Protocol Version Control	2
Release Key	No
Ringing Indicator	No

Table A-4 5ESS Custom Multi-Point Switch Translations

Attribute	Parameter
Line	2B+D
Line Code	2B1Q
Terminal Type	A
MAX B Channels	2
B1	CSD (or CSVD)
B2	CSD (or CSVD)
D	signalling
CSD	2
CSD CHANNEL	any
ACT USR	Yes
Dynamic TEI	Yes
EKTS	No
MTERM	1
CA PREF	1
Autohold	No
OneTouch	No
Display	No
Call Appearances	Idle

Table A-5 5ESS Custom Point-to-Point Switch Translation

Attribute	Parameter
Terminal Type	A
Call Appearances	1
Display	No
Channels for CSV per DN	1
Channels for CSD per DN	1

Table A-6 DMS-100 Custom Switch Translations

Attribute	Parameter
Line	2B+D
Line Code	2B1Q
Terminal Type	A
MAX B Channels	2
Circuit Switched Service	Yes
CSD/CSV Channel	Any
Signalling	Functional
Dynamic TEI	Yes
EKTS	No
Protocol Version Control	1
Max # Programmable Keys	3
Release Key	No
Ringing Indicator	No

Physical Specifications

B

This appendix includes the physical, electrical/electronic, and environmental specifications for the PortMaster Office Router.

Physical Specifications

Table B-1 provides physical specifications for the PortMaster Office Router.

Table B-1 Physical Specifications

Description	Design Specifications
Dimensions (H x W x D)	1.75" x 10.5" x 8.75" (4.3cm x 26.2cm x 22cm)
Weight	3.9 lb (1.8 kg)
Ethernet Interface	10BaseT (RJ-45) or AUI (DB-15)
Asynchronous Serial Interface	EIA/TIA-232/423 (RJ-45) (data rates up to 115,200 bps)
PCMCIA Interface (OR-M only)	Type-2 (data rates up to 115,200 bps)
ISDN Interface (OR-ST)	RJ-45 BRI (ST interface), providing two 64Kbps B channels.
ISDN Interface (OR-U)	RJ-45 BRI with integrated NT1 (U interface), providing two 64Kbps B channels.
Synchronous Serial Interface (OR-LS only)	1—capable up to 384Kbps
Synchronous Serial Interface (OR-HS only)	1—capable up to T1/E1 (2.048Mbps)

Electrical/Electronic Specifications

Table B-2 provides electrical/electronic specifications for the PortMaster Office Router.

Table B-2 Electrical/Electronic Specifications

Description	Design Specifications
Input Voltage	110 VAC +/-10%, 47 to 63 Hz, 1.0A 220 VAC +/-10%, 47 to 63 Hz, 0.6A
Power Dissipation	10 Watts
Memory	1MB RAM, 512KB NVRAM

Environmental Specifications

Table B-3 provides environmental specifications for the PortMaster Office Router.

Table B-3 Environmental Specifications

Description	Design Specifications
Operating temperature	32 to 104°F (0 to 40°C)
Storage temperature	-40 to 185°F (-40 to 85°C)
Operating humidity	10 to 90%, noncondensing

Cabling Specifications

C

This appendix describes pinouts for all supplied and optional Office Router cables.

RJ-45 Console Port to Female DB-25 Connector

The serial port (S0) is an EIA/TIA-232 (RS423-compatible) interface. Connect a PC serial port or ASCII terminal to this port to configure the router. A console cable is supplied with the PortMaster Office Router; it has a female DB-25 connector. The pinout is described in Table C-1.

To connect to a PC serial port, a 25-pin to 9-pin serial adapter may be required. To connect to a terminal, a male-male gender changer is required. Neither adapter is included with the router.

Table C-1 S0 to Terminal or PC Serial Port

PortMaster Office Router Serial Port (S0)				PC or Terminal Serial Port	
RJ-45	Name	Definition	Direction	DB-25 (DTE)	Signal
1	RTS	Request to Send	->	5	CTS
2	DTR	Data Terminal Ready	->	8 ¹	DCD
3	TXD	Transmit Data	->	3	RXD
4	GND	Signal Ground		NC ²	
5	GND	Signal Ground		7	GND
6	RXD	Receive Data	<-	2	TXD
7	DCD	Data Carrier Detect	<-	20	DTR
8	CTS	Clear to Send	<-	4	RTS
NC ²		Data Set Ready		6 ¹	DSR

1. Pins 8 and 6 in the DB-25 are connected internally.

2. Not connected



Note – To order additional cables from Livingston Enterprises, use product code CBL-CDB45.

RJ-45 Console Port to Male DB-25 Connector

Use a modem cable to connect an external modem to the S0 port on the router. This cable is included with the Office Router, and has a male DB-25 connector. Pinouts are described in Table C-2.

Table C-2 S0 to Modem

PortMaster Office Router S0 (Serial) Port				External Modem
RJ-45	Name	Definition	Direction	DB-25 (DCE)
1	RTS	Request to Send	->	4
2	DTR	Data Terminal Ready	->	20
3	TXD	Transmit Data	->	2
4	GND	Signal Ground		NC
5	GND	Signal Ground		7
6	RXD	Receive Data	<-	3
7	DCD	Data Carrier Detect	<-	8
8	CTS	Clear to Send	<-	5



Note – To order additional cables from Livingston Enterprises, use product code CBL-MDB45.

W1 Port to V.35 Connector (OR-LS and OR-HS only)

Table C-3 provides the pinouts for the DTE synchronous V.35 serial port connection, capable of speeds up to T1. The directions (input/output) are with respect to the PortMaster Office Router. Pins not listed have no connection.



Note – To connect to this port, use a V.35 cable. To order this cable from Livingston Enterprises; use product code CBL-V35-6.

Table C-3 W1 Port to V.35 Connector

PortMaster Port W1	V.35 Pin	Name	Definition	Direction
2	P	TXD	Transmit Data	Output
14	S	TXD-		
3	R	RXD	Receive Data	Input
16	T	RXD-		
4	C	RTS	Request to Send	Output
5	D	CTS	Clear to Send	Input
6	E	DSR	Data Set Ready	Input
7	B	SGND	Signal Ground	
8	F	DCD	Data Carrier Detect	Input
15	Y	ST	Send Timing	Input
13	AA	ST-		
17	V	RT	Receive Timing	Input
19	X	RT-		
20	H	DTR	Data Terminal Ready	Output

W1 Port to DB-15 X.21 Connector (OR-LS and OR-HS only)

Table C-4 provides the pinouts for the DB-15 X.21 to synchronous V.35 serial port connection, capable of speeds up to T1/E1. The directions (input/output) are with respect to the PortMaster Office Router. Pins not listed have no connection.



Note – To connect to this port, use an X.21 cable. To order this cable from Livingston Enterprises; use product code CBL-X21-6.

Table C-4 W1 Port to X.21 Connector

V.35 DB-25 Pin	Name	Definition	PortMaster Port W1	Connections	X.21 DB-15 Pin	Name
A	GRD	Ground				
B	SGND	Signal Ground	7	_____	8	SGND
C	RTS	Request to Send	4	_____	3	Control A
D	CTS	Clear to Send	5	_____		
E	DSR	Data Set Ready	6	_____	10	Control B
H	DTR	Data Terminal Ready	20	_____	12	Indicate B
F	CD	Carrier Detect	8	_____	5	Indicate A
R	RXA	Receive Data	3	_____	4	RXA
T	RXB	Receive Data	16	_____	11	RXB
V	RX CLKA	Receive Timing	17	_____	6	CLKA
Y	TX CLKA	Send Timing	15	_____		
X	RX CLKB	Receive Timing	19	_____	13	CLKB
AA	TX CLKB	Send Timing	13	_____		
P	TXD A	Transmit Data	2	_____	2	TXA
S	TXD B	Transmit Data	14	_____	9	TXA

W1 Port to DB-25 RS-530 Connector (OR-LS and OR-HS only)

Table C-5 provides the pinouts for the W1 to DB-25 RS-530 connection. The directions (input/output) are with respect to the PortMaster Office Router. Pins not listed have no connection.

The following table provides the pinout for the OR-LS and OR-HS DB-25 synchronous port. The directions (input/output) are with respect to the PortMaster. Pins not listed in this table should be left unconnected.



To connect to this port, use an RS-530 cable. To order this cable from Livingston Enterprises; use product code CBL-530-6.

Table C-5 W1 Port to RS-530 Connector

PortMaster Port W1	RS-530 CSU/DSU	Name	Definition	Direction
2	2	TXD	Transmit Data	Output
14	14	TXD-		
3	3	RXD	Receive Data	Input
16	16	RXD-		
4	4	RTS	Request to Send	Output
5	5	CTS	Clear to Send	Input
6	6	DSR	Data Set Ready	Input
7	7	SGND	Signal Ground	
8	8	DCD	Data Carrier Detect	Input
15	15	ST	Send Timing	Input
13	12	ST-		
17	17	RT	Receive Timing	Input
19	9	RT-		
20	20	DTR	Data Terminal Ready	Output

OR-ST ISDN/ST Port to RJ-45 Connector

Table C-6 provides the pinout for the OR-ST ISDN/ST port. The directions (input/output) are with respect to the OR-ST.

Table C-6 ISDN/ST Port to RJ-45 Connector

OR-ST ISDN/ST Port	Name	Definition	Direction
3	TXD	Transmit Data	Output
6	TXD-		
4	RXD	Receive Data	Input
5	RXD-		

OR-U ISDN/U Port to RJ-45 Connector

Table C-7 provides the pinout for the OR-U ISDN/U port. The directions (input/output) are with respect to the OR-U.

Table C-7 ISDN/U Port to RJ-45 Connector

OR-U ISDN/U Port	Direction
4	Input/Output
5	Input/Output

Ethernet Cabling

Specifications for the 10Mbps Baseband IEEE 802.3-compatible Ethernet interface are provided in Table C-8.

Table C-8 Ethernet Cabling

Ethernet Type	Connector Type	Cable Type	Transmission Distance
AUI (10Base5)	15-pin DIX for connection to external transceiver	RG-11 50 Ω coaxial	Trunk segment - 1,640 ft/500 m max Transceiver cable - 164 ft/50 m max Network trunk - 8,200 ft/2,500 m max
AUI (10Base2)	15-pin DIX for connection to external BNC transceiver	RG-58 A/U 50 Ω coaxial	Trunk segment - 984 ft/300 m max Station distance - 1.5 ft/0.5 m max Network trunk - 3,035 ft/925 m max
RJ-45 (10BaseT)	RJ-45 for 10BaseT	Unshielded Twisted Pair	Hub distance - 328 ft/100 m max Repeaters - 4 max

Using Modems with the PortMaster

D

The PortMaster Office Router OR-M supports two types of modems, a PCMCIA Type-2 modem in the PCMCIA slot (S1), and an external modem connected to the S0 port. All other models can use an external modem connected to the S0 port.

PCMCIA Modems

The PCMCIA modems in Table D-1 have been verified for use with the PortMaster Office Router. They are listed alphabetically by manufacturer.

Table D-1 Verified PCMCIA Type-2 Modems

Manufacturer	Model	Speed
AT&T	KeepInTouch	14.4/V.32bis
Cardinal	MVP288CC	28.8/V.34
DSI	Scout 144DF	14.4/V.32bis
Eiger Labs	Eiger 14.4	14.4/V.32bis
	Eiger 28.8	28.8/V.34
Hayes	Optima 14.4	14.4/V.32bis
Intel	Satisfaction	14.4/V.32bis
Megahertz	MHZ	14.4/V.32bis
	MHZ XJ2288	28.8/V.34
Motorola	Power Class	14.4/V.32bis
	Lifestyle	14.4/V.32bis
Multitech	2834LT	28.8/V.34
Newcom	14,400pcm	14.4/V.32bis
Practical	PC288T2-EZ	28.8/V.34bis
Premax	PCMCIA 14.4	14.4/V.32bis

Table D-1 Verified PCMCIA Type-2 Modems (Continued)

Manufacturer	Model	Speed
TDK	DF1414	14.4/V.32bis
	DF2814	28.8/V.FC
US Robotics	Sportster	14.4/V.32bis
	Sportster	28.8/V.34
	Courier	28.8/V.34
ZOOM	ZPCMCIA 14.4C	14.4/V.32bis

External Modems

Most external modems operate with the PortMaster Office Router.

Modem Tips

Livingston recommends any reputable vendor of V.32bis or V.34 modems. For best results, the modem should be configured as follows:

- Lock DTE rate at 115.2k or as high as the modem can operate reliably
- Raise DCD when it senses carrier (usually &C1)
- Reset itself when DTR is dropped (usually &D3, sometimes &D2)
- Use hardware flow control (RTS/CTS)
- For use with dial in, set s0=1 which answers the phone on the first ring

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